



1074085

Site Specific Standard Operating Procedure

SOP No.: CDM-LIBBY-07, Revision 1

SOP Title: Collection of Outdoor Ambient Air Samples

Project: Libby Asbestos Project

Project Number: 2616.006

Client: US Environmental Protection Agency

Approvals:

CDM Project Manager: _____ Date: _____

Technical Reviewer: _____ Date: _____

QA Reviewer: _____ Date: _____

EPA Approval: _____ Date: _____

1.0 Objective

The objective of this standard operating procedure (SOP) is to establish the baseline requirements, procedures, and responsibilities inherent to the collection of outdoor ambient air samples. Air samples will be collected as part of the outdoor ambient air program conducted in accordance with the *Final Sampling and Analysis Plan for Outdoor Ambient Air Monitoring at the Libby Asbestos Site (Site), Libby, Montana, Revision 1* (CDM and SRC 2006).

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2.0 Background

2.1 Definitions

Outdoor ambient air sample – For the purpose of this SOP, an outdoor ambient air sample is a sample collected as specified in the *Final Sampling and Analysis Plan for Outdoor Ambient Air Monitoring at the Libby Asbestos Site, Libby, Montana*.

2.2 Discussion

The specific activities detailed in this SOP will be used to conduct sampling of outdoor ambient air in the Libby Valley.

2.3 Associated Procedures

- CDM Federal SOP 1-2, Sample Custody, Revision 2
- CDM Federal SOP 2-1, Packaging and Shipping Environmental Samples, Revision 2
- CDM Federal SOP 2-2, Guide to Handling Investigation Derived-Waste, Revision 4

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- CDM Federal SOP 4-1, Field Logbook Content and Control, Revision 5
- CDM Federal SOP 4-2, Photographic Documentation of Field Activities, Revision 6
- USEPA ERT SOP #2008, General Air Sampling, Revision 0
- USEPA ERT SOP #2015, Asbestos Sampling, Revision 0

3.0 Responsibilities

All staff with responsibility for the collection of outdoor ambient air samples are responsible for understanding and implementing the requirements contained herein as well as other related project-specific requirements.

Team Leader – The team leader is responsible for communication with EPA regarding status and progress of the sampling event and providing support to Libby staff to ensure all necessary resources are available for implementation of the ambient air program.

Site-QA Coordinator – The site-QA coordinator is responsible for ensuring all quality assurance/quality control procedures related to this program are implemented.

Field Team Leader (FTL) – The FTL is responsible for ensuring that the specifics related to the collection of outdoor ambient air sampling described in this procedure are followed by all staff.

Field Team Members – The field team members are responsible collection and documentation of samples as described in the SAP and this SOP.

4.0 Required Equipment

The following is a general list of equipment that may be used:

- Sampling pump – high volume rotary vane pump with locking flow valve such as a GAST Model 1532, or equivalent. The selected sampling pump will be capable of a flow-rate and pumping times sufficient to achieve the desired air sample volume. The sampling pump will provide a non-fluctuating air-flow through the filter, and will maintain the initial volume flow-rate to within $\pm 10\%$ throughout the sampling period.
- Transmission electron microscopy (TEM) sample cassettes – commercially available, 25-millimeter (mm), three-piece cassette with a 50mm electronically conductive extension cowl loaded with a 0.45 micrometer (μm) mixed cellulosic ester (MCE) filter.
- Phase contrast microscopy (PCM) sample cassettes - commercially available, 25mm, three-piece cassette with a 50mm electronically conductive extension cowl loaded with a 0.8 μm MCE filter.
- Pump housings – Aluminum enclosure insulated with 2 inches of R-11 rated material, on legs 30 inches high with tie down provisions, fully opening gasketed entrance door

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with stainless steel piano hinge, lockable safety latches and spring loaded door, interior shelf with air passage holes, 500 watt (W) heat strip, exhaust fan with intake louver, thermostatically controlled, 120 volt (V) 15 or 20 amp (A) power cord, breaker panel and outlets. Housing measures 24 inches wide by 24 inches high and is 20 inches deep, such as EKTO Model 222SP, or equivalent.

- Stands – telescoping tripods designed specifically to hold sample cassettes at the desired height will be used to support the sample cassette in order to isolate the sample from the vibrations of the sampling pump.
- Inert tubing – Tygon tubing used in the sampling train to connect the outflow end of the sample cassette to the sampling pump. Tubing has a 3/16" inner diameter and 5/16" outer diameter.
- Rotameter – A rotameter calibrated such that the operator can measure flow rates to $\pm 5\%$ accuracy at the expected sampling flow rate.
- Air field sample data sheets – specific data related to the collection of each sample will be recorded on a stationary air field sample data sheet, Attachment 1. This sheet will contain all relevant information regarding equipment used, flow rates, and collection times.
- Logbook
- Plastic bags
- Extension cords
- Sample labels

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5.0 Procedures

5.1 Selection of Air Volumes and Flow Rates

Samples collected as part of the outdoor ambient air monitoring program are to be collected over a 5 day sampling period. This represents collection duration of 120 hours or 7,200 minutes. The target volume of air to be collected for each sample will be 14,000 liters of the collection period. As a result, samples will be collected at a flow rate of 2 liters/minute, which will result in a sample volume of approximately 14,400 liters.

In addition to the sample collected at the flow rate of 2 liters/minute, a second sample will be collected at a lower flow rate, 1.5 liters/minute. This sample is intended to serve as a backup for use if the sample collected at the 2 liters/minute flow rate is overloaded and can not be analyzed by TEM using direct methods.

In no event shall a sample be collected at a flow rate lower than 1.0 L/min, since the linear flow velocity would fall below 4 cm/sec, which is the minimum velocity specified by International Organization for Standardization (ISO) method 10312.

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As samples are initially collected during this program and analyzed, flow rates and sample times may be adjusted to ensure the sample filter has proper loading for the required analytical analysis and sensitivity goals.

5.2 Calibration Procedures and Flow Rate Adjustments

Each sampling pump will be calibrated before the start of each ambient air sample collection cycle. This is to ensure that each sampling pump is measuring the flow rate or volume of air correctly.

5.2.1 Calibration of Rotameter with an Electronic Calibrator

Rotameters used for pump calibration are calibrated to a primary flow standard on a quarterly basis. The primary flow standard in use at the site is a Dry-Cal (DC)-Lite primary flow meter manufactured by Bios International Corporation. Procedures for rotameter calibration with the DC-Lite flow meter are as follows:

1. Obtain the actual temperature and pressure in Libby, MT from the local National Oceanic and Atmospheric Administration (NOAA) weather station. Record actual temperature and pressure in the fields provided on the Precision Rotameter Calibration Data Sheet (Attachment 2).
2. Set up the calibration train as shown in EPA SOP #2015 Figure 4 (Attachment 3) with the sampling pump, rotameter, and primary flow meter.
3. Assemble the base of the flow meter with the screw provided and tighten in place. The flow meter should be mounted within 6° of vertical.
4. Turn the DC-Lite and sampling pump on.
5. Turn the flow adjust screw or knob on the pump until the desired flow rate is attained.
6. Calibrate rotameter to desired ball reading, as read from the middle of the flow ball, with a sampling pump and sample cassette in-line. Cassette must be the same type and from the same lot of sample cassettes that will be used for sampling. Record value in the Ball Reading column on the rotameter calibration data sheet.
7. Check adjusted flow rate of sample pump to the DC-Lite flow calibrator primary flow standard. Ten repetitive flow measurements will be averaged and that result recorded in the flow rate column for the selected interval.
8. Repeat this process at 10 intervals over the range of the precision rotameter.
9. Input data into rotameter calculation sheet to generate the corrected flow rate.

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5.2.2 Calibration of Sampling Pump with a Rotameter

Prior to sample collection, each sampling pump will be calibrated with a rotameter that has been calibrated as described in Section 5.2.1. The procedures used for sampling pump calibration are as follows:

1. Set up the calibration chain as shown in EPA SOP #2015, Figure 5 (Attachment 3) using a rotameter, sampling pump and a representative sample cassette. The sample cassette to be used for sampling is installed between the pump and the calibrator.
2. To set up the calibration train, attach one end of tubing to the sample cassette base; attach the other end of the tubing to the inlet plug on the pump. Another piece of tubing is attached from the sample cassette cap to the rotameter.
3. Assemble the base of the flow meter with the screw provided and tighten in place. The flow meter should be mounted within 6° of vertical.
4. Turn the sampling pump on.
5. Turn the flow adjust screw or knob on the manifold regulating air flow to the higher flow rate samples (manifold A) until the middle of the float ball on the rotameter is lined up with the pre-calibrated flow rate value.
6. Turn the flow adjust screw or knob on manifold regulating air flow to the lower flow rate samples (manifold B) until the middle of the float ball on the rotameter is lined up with the pre-calibrated flow rate value.
7. Verify the calibration of manifold A, adjust as required.
8. If adjustment of manifold A is required, verify the calibration of manifold B and adjust as required.

Each rotameter used for field calibration will be transported to and from each sampling location in a sealed zip-top plastic bag. The cap used at the end of the rotameter tubing will be replaced each morning it is used.

5.2.3 Adjustment of Flow Rates During Flow Checks

Flow checks will also be performed every 3 to 4 hours during the first two sampling events of the program, and then every 6 to 8 hours until the field team determines the checks can be reduced to twice per day for the remaining sampling events. During the checks, flow rates will be adjusted back to the target rate by adjustment of the flow adjust screw or knob. Adjustment of flow rates during flow checks will be performed as described below and as the last action before leaving a sampling location anytime the sampling pump is moved. Should the flow rate change by more than 10% the following procedure will be used to make the adjustment:

1. Connect the rotameter as described in Section 5.2.2 steps 1 to 3.

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2. Record the observed flow rate and time of observation.

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3. Adjust the flow rate, if necessary, to the target flow.

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4. Record the new flow rate and the time flow adjustment was completed.

Each rotameter used for flow checks will be transported to and from each sampling location in a sealed zip-top plastic bag.

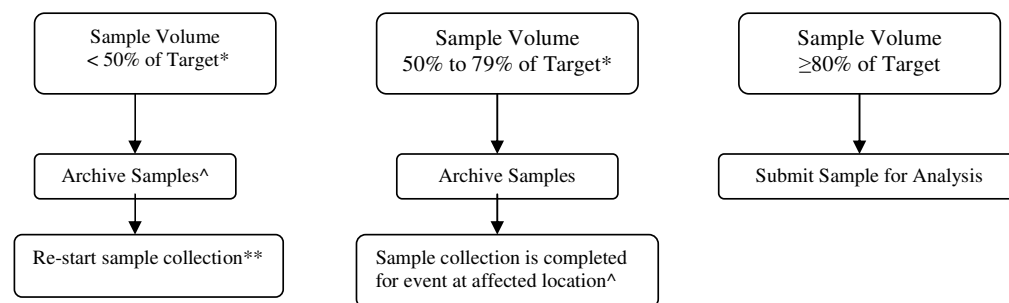
Should the flow rate change by more than 10% during the sampling period, the average of the pre- and post- flow rates will be used to calculate the sample volume during each check period. The individual volumes collected between these check periods will be added together to calculate the total sample volume collected. Attachment 4 illustrates the volume tracking spreadsheet that will be used in the field to determine the time required for sample collection. To track the scheduling of calibration checks, the field teams will use the Calibration Check Schedule Worksheet. An example of this worksheet is included as Attachment 5. Copies of all volume tracking spreadsheets and Calibration Check Schedule Worksheets will be provided to EPA and SRC at the conclusion of each sampling event. Electronic copies are suitable and will be placed in the project e-Room within one week from completion of each sampling event.

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<#>Remove the calibration train.¶
<#>Turn the sampling pump on and record the start time. ¶

If at any time the measurement indicated that the flow-rate has decreased by more than 30% or increased by more than 50%, the sampling shall be terminated, the affected sample archived. Figure 1 will be consulted to determine the proper procedure for further sample collection.

Figure 1 – Summary of Sampling Re-Start Procedures

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*Notify FTL of pump fault, pump should be serviced as required. FTL will notify CDM project management of pump failures. CDM project management will inform EPA RPM of affected samples.

**Affected sample location should only be re-started one time.

^EPA RPM will be informed of sample status for the affected location, and CDM and EPA will determine if samples should be submitted for analysis.

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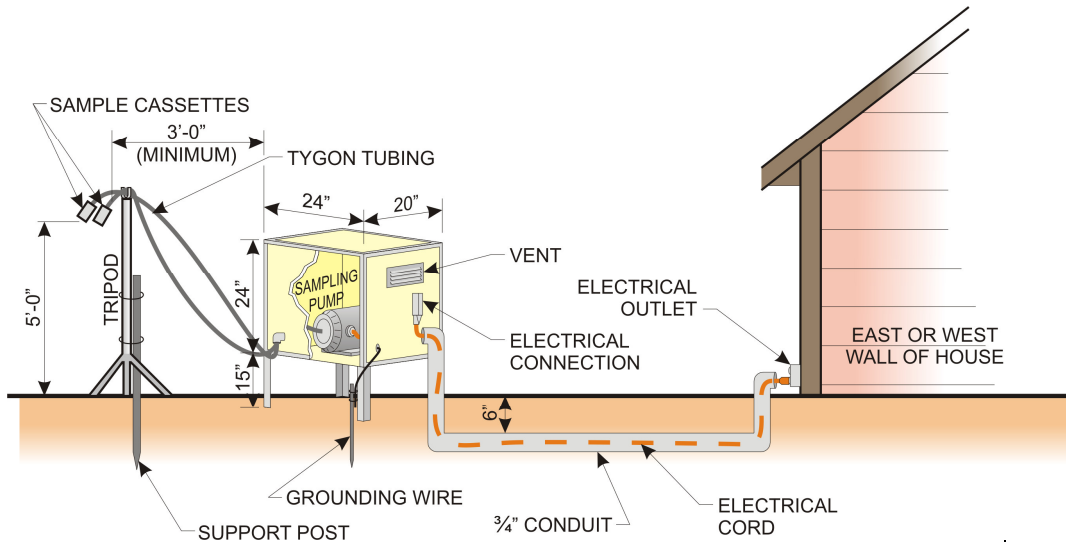
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5.3 Outdoor Ambient Air Sample Collection Procedures

5.3.1 Selection of Outdoor Ambient Air Sampling Locations

The position of each sampling location will be fixed; the sample will be collected from the same location for the duration of the outdoor ambient air sampling program. GPS points will be collected for the location of each station. The locations are to be positioned on the east or west side of buildings at least 15 feet from the outside wall, this will ensure the location is perpendicular to dominate wind directions in the Libby Valley. The location should also be placed to minimize interference for other nearby building, structures, or large trees. The sampling tripod will be placed a minimum of 3 feet away for the equipment housing. A typical sampling location set up is illustrated below.



5.3.2 Sampling Protocol

Each outdoor ambient air sample will be collected, after pump calibration, according to the following procedures:

1. Set up the sampling train; attach the air intake hose to the sample cassette base. The sample cassette will be positioned such that it is held facing downwards at an angle equal to or less than 45° from horizontal. Set the sample cassette to a height of 5 above ground surface and at least 3 feet away from the equipment shelter. Remove the sample cassette cap.
2. Plug the power cord into the power supply. If a generator is required, it will be placed as far away as possible from the sampling pump in the dominate downwind direction.

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3. Record the following in the field logbook and on the air field sample data sheet: date, time, location, sample number, pump number, starting flow rate, and starting time.
4. Turn the sampling pump on.
5. Check the sampling pump at the required frequency (every 3 to 4 hours during first two events, then every 6 to 8 hours, eventually phased down to twice per day). If a filter darkens in appearance or if loose dust is seen on the filter sample, collection shall be terminated.
6. At the end of the sampling period, orient the sample cassette up, do not remove the sampling cassette for the sampling train. Turn the pump off.
7. Collect the post sampling flow rate. The same sample cassette will be used to determine the post sampling flow rate.
8. Record the post flow rate.
9. Record the stop date and time.
10. Remove the tubing from the sample cassette. Still holding the sample cassette upright, replace the inlet plug on the sample cassette cap and the outlet plug on the sample cassette base.
11. Place a sample label on the sample cassette indicating a unique sampling number. Do not put sample cassettes in shirt or coat pockets as the filter can pick up fibers.
12. Place sample custody seal around both ends of the sample cassette.
13. Place each sample cassette in a plastic sample bag. Each bag should be marked indicating the sample identification number.
14. Transport the sample cassettes to the sample coordination area in a cooler that contains ice which is doubled bagged in one-gallon zip top plastic bag to keep moisture away from investigative samples.
15. Provide the sample coordinator with the appropriate documentation with the samples.

5.3.3 Pump Failure Procedures

If a sampling pump faults prior to the total desired run time, the following procedures should be used:

1. Record the time of the observed pump fault in the field notes.
2. Record the stop time as the time of the last field flow check.

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3. Record the ending flow rate as the rate observed at the time of the last field flow check.
4. Turn the sampling pump back on and calibrate as required (Section 5.2.2).
5. Restart sample collection.

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5.4 Collection of Meteorological (MET) Data

MET station data will be downloaded daily for existing NOAA stations in Libby, Helena, and Eureka. The NOAA station designations for these stations are shown below and the parameters recorded at each station are summarized in Table 1:

- Libby Fire Cache (NOAA station identification = LBBM8)
- Eureka (NOAA station identification = EURM8)
- Helena Regional Airport (NOAA station identification = KHLN)

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Table 1 – Summary of MET Data Collected At Ambient Air Support Stations			
Parameter	LBBM8	EURM8	KHLN
<u>Temperature (°F)</u>	✓	✓	✓
<u>Dew Point (°F)</u>	✓	✓	✓
<u>Relative Humidity (%)</u>	✓	✓	✓
<u>Wind Speed (mph)</u>	✓	✓	✓
<u>Wind Gust (mph)</u>	✓	✓	✓
<u>Wind Direction</u>	✓	✓	✓
<u>Solar Radiation (Wh/m² per hour)</u>	✓	✓	
<u>Precipitation (in.)</u>	✓	✓	✓
<u>Pressure (in.)</u>			✓

Notes: °F - degrees Fahrenheit; % - percent; mph - miles per hour; Wh/m² – watts per square meter; in. – inches; ✓ - parameter collected

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5.5 Quality Assurance/Quality Control

5.5.1 Equipment Maintenance

The manufactures' instructions regarding operating procedures and maintenance will be reviewed prior to equipment use. Equipment and instrumentation will be utilized in accordance with manufactures instructions.

5.5.2 Collection of Field Quality Control Samples

Field quality control (QC) samples will consist of three types: lot blanks, field blanks, and co-located samples. The following sections describe each of these types of samples as well as their collection frequency:

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Lot Blanks

Before samples are collected, two sample cassette lot blanks from each filter lot of 100 sample cassettes (1 per 50) used will be randomly selected and submitted for analysis. Lot blanks will be submitted for each filter type used. The lot blanks will be analyzed for asbestos fibers by the same method as will be used for field sample analysis. The entire batch of sample cassettes will be rejected if any asbestos fiber is detected on the lot blanks.

Field Blanks

One field blank will be collected each day sample collection begins and one, chosen randomly, will be analyzed per week for this sampling study. Field blanks should be collected for both filter types when they are in use. If asbestos fibers are observed on a field blank, other field blanks collected during that week will be submitted for analysis to determine the potential impact on sample results. The field blanks will be analyzed for asbestos fibers by the same method as will be used for field sample analysis. The blanks will be collected at different sampling locations throughout the week (one collected at a different location on each day of the week).

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Field blanks are collected by opening the sample cassette to the ambient environment for 10 seconds then re-capping the sample cassette.

Drying Blanks

For each set of samples (one COC) submitted to the laboratory for analysis, an unopened PCM cassette will also be submitted from the same cassette lot to be used by the laboratory as a drying blank.

Co-located Samples

Co-located samples will be collected at a frequency of one per sampling event per filter type. Field co-located samples will be collected beside a field sample and given a unique index identification number. Field co-located samples should be collected from varying sampling locations throughout the study area. The sampler will assign the same location ID to the co-located sample as the field sample, and will record the identification number of the field sample on the FSDS in the comments section. Co-located samples will be sent for analysis by the same method as field samples.

5.6 Documentation

Documentation of outdoor ambient air sampling will be recorded in three main locations: field logbooks, field sample data sheets, and the daily/impact observation memorandum. Each of these is discussed below.

5.6.1 Logbooks

Documentation of field activities conducted as part of this program will be recorded in logbooks maintained specifically for this sampling program. Logbooks are maintained by the field administration staff and are assigned unique identification numbers.

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The procedures specified in CDM SOP 4-1, Field Logbook Content and Control, Revision 5 (March 1, 2004) will be followed for logbook records.

5.6.2 Field Sample Data Sheets

Detailed sampling notes will be recorded for each sample on an FSDS (Attachment 1).

5.6.3 Daily Impact/Observation Memorandum

For each day that outdoor ambient air samples are collected a Daily ~~Observation~~/Impact Memorandum, and Excel file type, will be completed. An example of this memorandum is included in Attachment ~~6~~.

Information to be recorded ~~will include~~ the following: location of all removal and remedial actions being conducted; other observations that could affect sample results; equipment issues, and any deviations from the project guidance documents.

6.0 References

CDM and SRC. 2006. Final Sampling and Analysis Plan for Outdoor Ambient Air Monitoring at the Libby Asbestos Site, Libby, Montana. September.

International Organization of Standardization. 1995. Ambient Air – Determination of Asbestos Fibers – Direct Transfer Transmission Electron Microscopy Method. ISO 10312:1995(E).

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United States Environmental Protection Agency, Office of Emergency and Remedial Response. 1992. Quality Assurance/Quality Control Samples, Quality Assurance Technical Information Bulletin. April.

United States Environmental Protection Agency, Emergency Response Team. 1994. Asbestos Sampling, Standard Operating Procedure #2015, Revision 0.0. November 17, 1994.

United States Environmental Protection Agency, Emergency Response Team. 1994. General Air Sampling Guidelines, Standard Operating Procedure #2008, Revision 0.0. November 16, 1994.

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Table 1 – Summary of MET Data Collected At Ambient Air Support Stations			
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Temperature (°F)	√	√	√
Dew Point (°F)	√	√	√
Relative Humidity (%)	√	√	√
Wind Speed (mph)	√	√	√
Wind Gust (mph)	√	√	√
Wind Direction	√	√	√
Solar Radiation (Wh/m ² per hour)	√	√	
Precipitation (in.)	√	√	√
Pressure (in.)			√

Notes: °F - degrees Fahrenheit; % - percent; mph - miles per hour; Wh/m² – watts per square meter; in. – inches; √ - parameter collected